20 Cents

THE FORESTER

Vol. VII OCTOBER, 1901 No. 10

CONTENTS:

Published by

The American Forestry Association

Lancaster, Pa., and

Washington, D. C.

Entered at the Post Office of Lancaster, Pa., as second-class matter.

SCENE IN THE LONGLEAF PINE FORESTS OF EASTERN TEXAS. THE ADVICE AND ASSISTANCE OF THE U. S. BUREAU OF FORESTRY HAS BEEN REQUESTED IN THE HANDLING OF ONE MILLION ACRES OF THIS TIMBER LAND.

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NEWS, NOTES, AND COMMENT.

An Apology. An apology is due the readers of THE FORESTER for the tardy appearance of the September number. The delay was occasioned by very unusual circumstances: the editor on his way home from the Denver meeting had his suit case, containing the copy for the September number, stolen. Thus it was necessary to make up the number a second time. The hard luck did not end at this point, for the suit case also contained copies of all the papers read at the Denver meeting. Not even the thought that the thief was unable to realize on the contents of the suit case at a pawn-shop can reconcile us to the loss. Let it be hoped that he was at least an enthusiast on forestry and irrigation, therefore getting something of value for risking a trip to the penitentiary.

Through the kindness of the authors copies of these papers have been secured, and they will appear in THE FORESTER as rapidly as space will permit.

Private Forestry on a Large Scale. The latest request received by the Bureau of Forestry for assistance in the handling of private woodlands, is one for a working plan for about 1,000,000 acres of longleaf pine land in southeastern Texas. This timber land is the property of the Kirby Lumber Company and the Houston Oil Company, of Texas.

The holdings of these concerns cover about eighty per cent. of the virgin forest of longleaf pine in Texas. The officials state they are very anxious to exploit their forests on scientific lines, cutting the merchantable timber in such a way as to insure protection to the young growth. A preliminary examination of this large tract will be made by the Bureau, likely in December.

All things considered this large area of timber land, if handled on the lines which the Bureau will advise, should prove one of the most interesting undertakings in the line of forestry for private owners yet attempted in the United States.

This immense tract, covered with a heavy growth of timber that is in constant demand, with markets by rail and water near at hand, if exploited in a conservative manner, should bring splendid returns to its owners. Adding the fact that the tract is located in a section of the country where tree growth is rapid, it does seem that the owners will act wisely in handling the whole along the lines of scientific forestry.

U. S. Forest Reserves. The feeling that the technical management of the United States forest reserves should be under the direction of the Bureau of Forestry, is becoming widespread. The immense areas included in these reserves present a number of forest problems that only trained foresters can solve. The questions of the regulation of grazing, prevention of fires, cutting of timber, and caring for the water supply in the reserves are of vital importance to the entire west. In many sections

the water supply for irrigation and other purposes is directly dependent on the forested areas within the reserves. Besides the future timber supply must in a great measure come from the same source; it is therefore of the utmost importance that these reserves should receive the wisest possible administration.

Dr. B. E. Fernow, director of the New York State College of Forestry, in a recent statement published in *Recreation*, sums up the situation in a convincing manner. We quote Dr. Fernow's remarks on this point:

"That finally the Federal Government must institute a full-fledged management of its 40 forest reserves, comprising over 46,000,000 acres, is self evident, and it is only a question how soon and how this will come about. At present the General Land Office is still in charge of this property, but already the Secretary of the Interior has recognized that technical management of these timber lands is necessary and has called on the Bureau of Forestry to prepare the necessary plans. As soon as such plans are formulated, their execution should also be left with the Bureau, for technical supervision of the cutting of timber is as essential as technical plans, and it is questionable whether the General Land Office, which was instituted simply to dispose of the public domain, could be so organized as to furnish this technical supervision and continuous management."

WASTEFUL METHODS OF LUMBERING IN BLACK HILLS FOREST RESERVE, SOUTH DAKOTA. WITH THE TECHNICAL MANAGEMENT OF THE RESERVES UNDER THE DIRECTION OF TRAINED FORESTERS, SUCH WASTE COULD BE AVERTED.

A Change of Base.

For the benefit of those persons so fond of referring to our "inexhaustible timber supply," we reprint the following from the Chicago *Post:*

"Word has been received that the last stick of lumber belonging to Knapp, Stout & Co., of Menominee, Wis., was sawed today and that the mills have closed permanently, after being in operation longer than half a century. This is considered by lumbermen as another step toward the desertion of Wisconsin by that interest. Not many years ago this state and its neighbor, Michigan, were numbered among the largest lumber-producing states of the Union. To-day the White Pine, which first attracted investors, has been almost entirely exhausted.

"Company after company has deserted these districts and sought new fields where the forests are thick and where they can be purchased standing at a nominal price. Companies now operating north of Illinois are either going far into the interior to get White Pine, or else they have turned their attention to Hemlock and hard woods which can be found. Thirty years ago when government land could be purchased in this district for less than $2 an acre, the White Pine was most in abundance and Hemlock was spurned, as it did not bring enough money when cut, sawed, and shipped to the market. Now this is changed, and even the Hemlock has been cleared out to a large extent. In the northern part of Wisconsin and parts of northern Michigan, not adjacent to the lake, the forests still flourish, but the monarch pine has been slaughtered."

The "inexhaustible timber supply" of Alaska has furnished a theme for numerous articles on how the rest of the world would some day find a most abundant supply of timber in the Alaskan forests. But here are a few facts recently published in the San Francisco *Chronicle*, which tell the same old story:

"Wherever commerce invades the timber lands the forest growth quickly disappears. This is aptly illustrated in the experience of the Yukon Valley in Alaska. The steamer traffic of only three or four seasons on that river has already created a timber famine on its banks. Of course, that section of Alaska is not heavily timbered. Most of the commercial forests of the Territory lie farther south and nearer the sea coast, where the climate is milder and more favorable to the growth of coniferous trees. These forests have always been spoken of as inexhaustible. But we are learning in this state the sad lesson that once the woodman begins to hew for commercial purposes a time limit can be quickly set on the life of the densest timber growth, particularly if nothing is done for its conservation and renewal, as is liable to be the case in Alaska.

"The exhaustion of the timber supply on the banks of the Yukon River will create a serious problem in the navigation of that stream. It is now a great commercial highway, whose importance is growing each year. All the boats plying its waters have been drawing their fuel from its forests. These are now failing rapidly, and, unless coal or oil is discovered in available quantities in the neighborhood, river navigation will have to be abandoned soon."

The Fire Record. Since the September FORESTER went to press the following forest fires have been reported:

Michigan. A few days ago near Port Huron, Mich., during a squall on Lake Huron, six vessels were wrecked on the beach. The crews of all the vessels were rescued by the life saving crew during the night. A heavy smoke caused by forest fires hung over the lake and caused the navigators to lose their course.

From Detroit comes the news that for days the dense smoke from Canadian forest fires hung over Lake Erie, Lake Huron, and the Detroit River and practically tied up navigation. Fully a dozen excursion boats were unable to return to the city and hundreds of excursionists who left Saturday afternoon were compelled to spend the night on the boats. The smoke from these forest fires was carried across Lake Michigan to Chicago where it hung in dense clouds.

Colorado. On Sunday, September 22d, a forest fire broke out in the mountains near Eldora, Boulder County, and at last

reports was still burning. The first report stated that fully thirty-five square miles of heavy timber had been burned, and many mine buildings destroyed. A large number of men fought the fire for days but were unable to get it under control, and assistance was then asked of the Department of the Interior, as the fire was burning over government land. The fire was caused through the neglect of a camping party to extinguish their fire. In passing it may be noted that only about six per cent. of the present area of Colorado is forest land; and this small portion is being rapidly destroyed by fires each year.

SCENE IN PIKE'S PEAK FOREST RESERVE, SHOWING PRESENT CONDITION OF MANY MOUNTAIN SLOPES THAT WERE ONCE HEAVILY WOODED. RECKLESS CUTTING AND REPEATED FIRES HAVE REDUCED THE FORESTS OF COLORADO TO ABOUT SIX PER CENT. OF THE STATE'S AREA. MEANWHILE THE FIRES CONTINUE TO BURN.

Washington. Forest fires during August were the worst in years and did great damage to the timber belt along the Columbia River on both Washington and Oregon shores. The town of Mooresville, four miles back from the Columbia River, was surrounded by fire and for some time grave fears were entertained for its safety. Ranchers living in this district had many buildings destroyed by fire, and for some days they were compelled to fight the flames. The loss in timber will amount to many thousands of dollars.

Especially fierce fires during the early part of the month raged between Lake Sammanish and on the Snoqualmie River, and Halley's lumber camp on the Snoqualmie River was only saved by the strenuous efforts of fifty men who fought the flames. Thousands of dollars' worth of timber was destroyed. Another tremendous fire raged in Woodenville and Grace on the Seattle Division of the

Northern Pacific. Several farm buildings were burned and damage has been done to timber in Chehalis and Mason counties. On August 11 an overland train on the

LUMBERED AND BURNED FOREST NEAR PORT CRESCENT, OLYMPIC PENINSULA, WASHINGTON.

Great Northern railroad had a thrilling race with the flames leaping about it on both sides. Four bridges along the road caught fire during the day but prompt action on the part of the railroad employees prevented their being destroyed.

Foreign. From Berlin comes the report of a terrible forest fire during the first week of August in the extensive pine forests of Kalkirchen on the Dutch-Prussian frontier. Several thousand acres of valuable timber were destroyed, train service throughout the district had to be suspended and the damage up to the time of the report had already reached $240,000.

In Russia the total loss from recent forest fires is estimated at $50,000,000. The fires have been mostly incendiary. It is estimated that 250,000 acres of forest land have been burned over and 187 villages completely or partially destroyed.

In northern Ontario and Quebec the damage to standing timber by forest fires is estimated at from $2,000,000 to $3,000,000, including the holdings of private owners and the government. At the settlement of White Bay in Newfoundland 23 houses were recently destroyed by a forest fire. Many fires are also raging on the British Columbia coast.

Hawaii. A recent report received from Honolulu states that a forest fire which began in the Hamakaua district several weeks ago is still burning, and threatens incalculable damage to the plantations and forests in its vicinity.

It has already burned over thousands of acres. At last reports the fire was driven by strong winds and was threatening a tract of between 40,000 and 50,000 acres of forest. It has been proposed to call out the national guard and set the soldiers at work on the fire.

The area burned is almost wholly government land, but cane fields are threatened. It is estimated that the fire is twenty miles in length. Live stock has been removed to Hilo to prevent the animals dying for lack of water, and there has been a general exodus of settlers from the district since the unprecedented conditions developed.

Forestry in the South. The Bureau of Forestry continues to receive requests for assistance in the handling of timber lands in the South. In addition to the request for a preliminary examination of 1,000,000 acres of longleaf pine land in Texas, already mentioned, several other requests have recently been received. Burton & Co., have asked for an examination of their tract of 25,000 acres of pine land situated in Berkeley county, South Carolina.

The East Tennessee Iron and Coal Company, owning 60,000 acres of hardwoods in the Cumberland mountains, are anxious to cut their timber on conservative lines, and have requested a preliminary examination of their tract. From North Carolina comes a request from Mr. Hugh McRae, for advice in the handling of 16,000 acres of hardwoods, situated near Grandfather Mountain. An examination is also asked for 16,000 acres of pine land in Polk County, Ga. Agents of the Bureau of Forestry will inspect these tracts at an early date.

A working plan is to be made this winter by the Bureau for the woodlands belonging to the Okeetee Club, the preliminary examination having already been made. This tract is located in Beaufort and Hampton Counties, South Carolina.

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Tree Planting in Wisconsin. Mr. Wm. L. Hall, Superintendent of Tree Planting in the Bureau of Forestry, has just completed, an examination of 15,000 acres of "cutover" white pine land in Wisconsin. The tract is the property of the Bay Shore Lumber Company of Chicago and is located in Forest county. The land was cut over about fifteen years ago and left idle, meantime growing up in Birch, Red Cherry, Alder, and Aspen.

An examination of this tract was requested of the Bureau of Forestry, by the owners, in order to determine if replanting would be feasible. Mr. Hall will reccomend experimental planting of White Pine on a small section of forty acres to test what can be done. In case of success, planting on a large scale will likely follow.

THESE SHEEP WERE BEING HERDED ILLEGALLY IN A FOREST RESERVE.

Sheep Raising and Forest Reserves. Senator F. E. Warren, at the annual meeting of the Eastern Wyoming Wool Growers' Association held recently, read a paper on the sheep raising industry in which all mankind, excepting the sheepman, came in for a lampooning. According to this paper there are but two kinds of men: sheepmen and their enemies; and of the latter Senator Warren classed as most dangerous the "theorists" and "faddists." Considerable space is devoted to the "theoretical forest reserve makers, who, from Pullman cars or eastern office rooms, map out forest reserves as big as eastern states."

We can imagine with what salvos of approval Senator Warren's audience received this antiquated product of an obscure joke carpenter, long since dead. But the Senator betrays a decided lack of information as to the way in which reserves are established, what they are established for, and the present sentiment among western people generally on the reserve question.

If Senator Warren will take the trouble to look into the matter he will find that the Federal government usually assigns such tasks as the laying out of reserves to competent men. Further, that the ques-

tion of creating a reserve is considered in its possible effects on every class of people and industry, rather than for a certain set of individuals or a single industry. Senator Warren was talking to sheepmen on this occasion and his paper was in the right vein to please.

Senator Warren in his paper asserts that "everybody is against the sheepman." Anyone acquainted with the present conditions in the West knows there is a great deal of truth in this statement and the "enemies" of the sheep raiser, as Senator Warren puts it, are legion. The responsibility for this condition of affairs rests with the sheepmen themselves. Fair-minded people, and the west has a big proportion of them, do not deny the rights of the sheepmen, but the latter on the other hand have been disregardful of the fact that sheep raising is but one industry and that there are many other occupations that deserve consideration.

In a word, the opposition to forest reserves, on the part of sheepmen and others, has been caused by the cutting off of the "something for nothing" state of affairs. Free pasturage, and free use of public lands cannot be given up without a struggle. That is the bone of contention: "something for nothing."

The forest reserves of the West will be increased in number and area from time to time, simply because it is the wish of the great majority of people of that section. The feeling in favor of the reserves is growing stronger every day.

The accompanying illustration is suggestive of conditions in certain sections of the west, and will give some idea of the way the sheepmen make "enemies."

Forestry in Kansas. The Topeka *Capital* "hopes to see the Kansas Legislature in the near future set individual land owners a good example and incidentally accomplish valuable results for the state, by inaugurating a systematic Bureau of Forestry."

The point is well taken, and the *Capital's* statement that "Kansas can rival any locality in producing artificial forests" is borne out by results obtained in many sections of the state. The accompanying illustration shows one of the successful forest plantations of Kansas. Kansas can grow forest trees and the state can do a great deal of good by encouraging the people to take up tree planting more generally.

YAGGY CATALPA PLANTATION IN RENO CO., KAN. TREES TEN YEARS OLD AND FOUR TO SIX INCHES IN DIAMETER.

Pennsylvania Forest Preserve. The State Forest Commission of Pennsylvania recently concluded the purchase of the furnace property of the Mont Alto Iron Company, and about 23,000 acres of mountain land in Franklin and Adams counties, running down to the Maryland line. This latest addition to the State's forest preserves lies along and

across what is known as South Mountain, a part of the Blue Ridge, and is one of the most picturesque sections in Pennsylvania. It has hundreds of beautiful springs and is well timbered throughout, a new growth having replaced the timber cut off years ago to furnish charcoal for the furnace. The mountain tops on the tract are about 1,200 feet above sea level, and from an observatory built upon one of them can be had a magnificent view of the Cumberland Valley from the Susquehanna to the Potomac.

A pleasure park, comprising hundreds of acres, with paths made through the forest, rustic bridges across all streams and many buildings for the comfort and entertainment of visitors is a part of the purchase and is known as Mont Alto Park, the resort of many thousands of people every year. The price paid for the 23,000 acres is understood to be about $7.50 per acre.

Tree Planting in Indiana. A forest plantation 4,100 acres in extent is to be started in the Kankakee bottoms, Newton County, Indiana. The land, which is the property of Mr. Joseph Adams, of Chicago, was recently examined by Mr. George L. Clothier, an agent of the Bureau of Forestry, and Mr. W. H. Freeman, secretary of the Indiana State Board of Forestry. The examination was made in order to determine upon plans for the planting.

The object in starting this plantation is to establish a permanent forest, and it marks the first attempt in Indiana at tree planting on the advice of a trained forester.

THE REFORESTATION OF OUR WATERSHEDS.*

By T. P. Lukens.

THE question of the management of our depleted and rapidly disappearing forests is second to no other in importance to the people of the United States. No nation on earth was so blessed in the beginning with the extent and quality of forests as our own, but through lax laws and political influence the mass of our forests have passed into the hands of a few. Not only is the waste and destruction of the original crop distressing, but also the entire disregard of the future that has been thus far the rule.

While the economic question of forestry is of vital importance to the whole people, on which volumes could be written, the phase of this question which most concerns the people of southern California is the preservation of our forests for the conservation of water. It is no longer a disputed question that the depletion of forests causes the extremes of flood and drouth. Humid regions become arid, for proof of which we are no longer compelled to cite Palestine and other parts of the old world, but we see it clearly portrayed in our own country.

In the seven counties of southern California, there is approximately 10,000 square miles of arable land, with a population of 305,000 and property with assessed value of $160,000,000. There is an almost unbroken range of mountains, from the coast in Santa Barbara county to San Diego, that forms a barrier from the Mojave and Colorado deserts on the north and east. This mountain area of 4,500 square miles has wisely been set aside as forest reserves, for on this rugged mountain range southern California depends for its supply of water for all purposes.

So much is known of the early history: that the mountains were well forested,

*Read at the summer meeting of the American Forestry Association, Denver, Col., Aug. 27–29.

the valleys were well covered with oak trees, and the streams flowed continuously above ground. Until recent years sheep-raising was the chief industry. They were herded in the mountains without restraint, and, as is known to all observers, destruction and devastation are the result of sheep-grazing in our mountains, especially in arid regions. For a while the sheep men annually burned their ranges, to make accessible new areas, until now there is but a small portion of these mountains which has not been burned over. There are many other causes of fire, but they are due to the carelessness and indifference of man in nearly every case. Laws inflicting a heavy fine and punishment do not check the destruction perceptibly. In spite of the fact that each year many fires have occurred in these mountains, the aggregate of fines that have been imposed on the individuals responsible for their origin, is merely nominal. In the twelfth century, Germany became alarmed at the

FIG. I. YELLOW PINE FOREST IN SAN BERNARDINO FOREST RESERVE, SOUTHERN CALIFORNIA.

great number of fires, and to abate the evil a law was passed punishing any one wantonly setting fire to the forests. The punishment was this: the offender was bound hand and foot and drawn three times through the fire. Although this punishment was inflicted upon offenders, the destruction continued until the forests were well guarded.

The question of protecting the small portion of forests still remaining and of rehabilitating the vast areas that have been denuded, can only be accomplished by the adoption of a rational forest system. Why should our country, so enlightened and so far in advance of other nations in the mechanical arts and industries, be so lax and deficient in the management of its forests? Surely not for lack of skill and intelligence. We cannot concede that Germany, France, and other nations that are not only realizing a direct profit from their forests, but have rebuilded agriculture to a profitable plane, without which no country can succeed, can do more than we. Their rivers have returned, and all the manifold blessings induced by forests.

When once the management of our forests is placed, to remain, in the hands of our skilled foresters, backed up with liberal appropriations and unhampered by political parties, then the wanton waste and destruction will be reduced to the minimum. So our forests, being rehabilitated with all blessings, will soon become self-supporting.

FIG. 2. SCENE IN SAME FOREST ONE WEEK LATER, SHOWING LOPPINGS LEFT AFTER CUTTING.

There is abundant proof that the mountains of southern California were once heavily timbered. Fully 80 per cent. of all the area now is covered with brush, but for the most part sparsely. This brush, naturally very inflammable, when heated by a few weeks of constant sunshine becomes as tinder, and a fire once started is most difficult to control; in fact it cannot be controlled until fire breaks are made by removing the brush along the ridges. The handful of men employed as rangers, one

man to 37,000 acres of steep, rugged mountains, is entirely inadequate, although they have accomplished a great deal in watching careless persons, and in putting out small fires. A bucket brigade in a large city would be as effectual in battling fire as the small number of men now employed in the reserves.

FIG. 3. SHOWING BUSH COVERED AREA IN THE SAN GABRIEL FOREST RESERVE, SOUTHERN CALIFORNIA.

While the brush is valuable as a water conserver, a tree covering is much more desirable, inasmuch as the soil under trees is cooler and moister than under brush. The roots of trees are larger and penetrate to a greater depth, and the surface receives more humus to form a mulch to retain the water and prevent evaporation. As fast as the brush is burned, there should be planted the seed of indigenous trees. An area forested exclusively with trees has also the advantage of being less susceptible to fire.

What to plant and how to plant must be be governed by local conditions. Within the boundaries of our 46,000,000 acres of forest reserves, the structural and climatic conditions vary greatly. I have the most profound respect for Nature—she has made no mistake in planting trees, all being suited to the conditions surrounding them. While it is possible some foreign trees will thrive for a while, it is not safe to plant other than indigenous trees except in an experimental way.

The forested area of southern California is about equal to that of Prussia where, under government control, the annual net profit of $1.50 per acre is realized, beside the incalculable indirect benefit of equalizing stream flow, etc. In the Grand Duchy of Baden the annual net direct profit is $2.60 per acre, ten cents an acre annual net profit more than our govern-

ment received for the redwood forests. One average redwood tree from the California forest will yield more timber than any acre of forest in Prussia. With all these facts in sight, our government should withdraw from sale every acre of timber land unsold; and, cared for by the Bureau of Forestry and the trees milled as they mature, the profits would go far toward the rebuilding of our devastated areas.

We have some most striking comparisons, showing the value of forest covering for the conservation of water. The San Gabriel River Basin watershed with an area of about 23 square miles delivered less than 100 miners' inches during the dry months of 1900, while the San Antonio, with one-half the area, produced 175 miners' inches at the minimum. These basins are contiguous in the same

FIG. 4. SHOWING SPRUCE AND PINE FOREST THAT FORMERLY COVERED THE ENTIRE AREA SHOWN IN FIG. 3. TREES DESTROYED BY RECKLESS CUTTING AND REPEATED FIRES; AT PRESENT ONLY A FEW LEFT IN PROTECTED OR INACCESSIBLE PLACES.

range. There is the same precipitation in each, but the San Gabriel has been repeatedly burned until much of the area is nearly bare, and consequently the water conserving power is seriously impaired. The San Antonio basin has been burned but little, and the covering in most part is intact.

Bear Valley, in the San Bernardino reserves, contained in 1860 two large lakes, each covering more than a section, and about 5,000 acres of rich meadow. Late in the sixties, sheep were driven into the valley, and during several of the first years of herding, at least 30,000 sheep were pastured there. Later the feed became scanty and the number was decreased until at the end of twenty years of grazing, the number was reduced to 2,000 and the food was poor for that number. There were formerly large streams which not only kept the lakes full, but discharged through the summers large volumes of water. Now the lakes are dry and the streams have so diminished that during five months of the year the streams do not reach the outlet of Bear Valley Dam. The slopes of the mountain forming the watershed of Bear Valley, once so rich in tree and bunch grass covering, are nearly bare. Natural reforesting, as conifers matured and died, was precluded by the sheep, since they ate all little conifers as they showed themselves above ground.

The Vandeventer Valley, in the San Jacinto Reserve, comprising about 3,000 acres, had not been disturbed by man or beast up to 1870. In that year 2,000 cattle were driven in, and were soon fattened on the luxuriant growth of grass. A large stream flowed through the meadow from Toro Mountain. This herding of cattle was continued for twelve years. I visited this valley last summer and found no grass, no water, and nothing growing in the valley but worthless sage-brush. Everywhere I find the most distressingly evil effects of stock grazing in the forest reserves. It is not feasible to regulate stock grazing; where communities depend upon water for irrigation, who can determine the number of sheep or cattle that can be herded without destroying or seriously injuring paramount interests?

During a dry year in the valleys, just the time when the mountains should be undisturbed, there would be the greatest desire on the part of stock men to drive their herds to the mountains; at that time also, there is more danger of fire. Stock is driven into forest reserves every year, presumably to be fed on owned or leased land. I have one case in mind where 700 cattle were driven into a leased meadow, capable of feeding no more than 200 head. Cattle are turned loose and roam at large, destroying the grasses and little conifers on all slopes; hence, all stock herded in the reserves on private holdings should be under fences, ingress and egress to which should be compelled by roads.

The total assessed value of all the sheep and cattle in the seven counties of southern California is $1,200,000, while the assessed value of the property dependent on the water conversed in our reserves is $160,000,000. It is clearly seen which is the paramount interest. People with homes in the reserves are a help in keeping down fires, but the people who go in for a frolic should be under watchful restraint, if permitted to go at all.

Lumbering in southern California has always been unprofitable to the investors, owing chiefly to the inaccessibility of the timber regions. The mountains are so precipitous that to reach the pine and fir forests necessitates the building and maintaining of very expensive roads, over which to haul the lumber. Then the prodigal extravagance so universally displayed where something is acquired for nothing is conspicuous here; the scrap heap is much larger than the lumber piles. The trees fit for milling grow at an elevation of from 5,000 to 8,000 feet. The trees grew sparsely, and in consequence the limbs are large and grow low, resulting in knotty lumber, and a waste of at least one-half the tree; worse than waste, for the lopings are left to dry and become a menace to the new forest.

A sad sight it is to see a deforested area in our semi-arid country, where a tree is so valuable as a water conserver. It is a desolate picture. The same crop could be harvested by the forester and his trained

assistants more profitably by cutting only mature trees and effectually disposing of the lopings, without disturbing the well-mulched surface which is so essential.

When forest trees are removed, if man will assist just a little, reforestation will be speedy and complete, for the surface is rich. But after repeated fires it is more difficult. The soil that has been building for one or two hundred years, is nearly or quite gone, and the rains run off rapidly, while the sun and wind dry up the surface.

The plan to build storage reservoirs, as advocated by the National Irrigation Association, is most commendable and should receive the support of every friend of forestry. At the same time let us put our natural reservoirs in repair. The rainfall on our mountains will average 48 inches annually, and if our mountains are well clothed, at least one-half will be retained by percolation. With our 4,500 square miles of watershed in southern California, we would have 2,800,000 acre feet of water for irrigation. Then would our country be productive and bloom as the rose, and be capable of sustaining a greater population than the same area in any part of the world.

And what is true of southern California is true of all the western arid and semi-arid portion of the country; capable, when the forest and irrigation plans are perfected, of sustaining a greater population than now exists in our nation. Stop fires, plant trees, and build reservoirs.

INSECT ENEMIES OF FORESTS AND FOREST PRODUCTS.

By A. D. Hopkins,

Entomologist, West Virginia Agricultural Experiment Station.

THE problem of insect enemies of forests and forest product, is becoming one of special interest and importance to consider in connection with other problems relating to the introduction and practical application of scientific methods of forest management.

The evidence obtained by the writer from special investigations along this line during recent years, is conclusive that the losses resulting from the depredations of insect enemies of living forest trees are very great. This is true both as related to the direct causes of death of trees, and of the pin and worm hole defects in the standing timber, and the manufactured product.

Some of the most striking examples of these insects and their ravages may be briefly mentioned as follows: the destructive pine bark beetle,* which in 1891–1893 was so vastly destructive to the pine and spruce forests of the middle Alleghanies. The chestnut timber worm* is the most destructive enemy of the wood of the old living chestnut trees throughout the Appalachian region. The oak timber worm† is not only destructive to the wood of living trees, but also heavy oak lumber and timbers in mill yards and in structures under conditions which favor a continued moist condition of the wood. The destructive heart wood borers‡ infest and are destructive to the wood of living trees injured by fire and other causes. Other wood-boring insects breed in the wood of old dead trees, stumps, logs, railroad ties, and other heavy construction material after it becomes old and begins to deteriorate.

The spruce-destroying beetle§ of the northeastern spruce region is another ex-

**Dendroctonus frontalis destructor* Zimm Hopk.

**Lymexylon sericeum* Harr.
†*Eupsalis minuta* Drury.
‡*Cerambycid* and *Buprestid* beetles.
§*Dendroctonus piceaperda* Hopk.

WORK OF WESTERN PINE BARK BEETLE IN BARK OF *Pinus ponderosa*. SPECIMEN FROM McLOUD RIVER NEAR MT. SHASTA, CALIFORNIA.

ample of a great destroyer of matured spruce timber, which within the past half-century has caused the death of billions of feet of this valuable timber.

There are a number of other examples of destructive enemies of the principal forest trees of the Rocky and Cascade mountains and coast regions of the Northwest, discovered by the writer during investigations there in the spring of 1899. The western pine destroyer* attacks and kills the finest specimens of the Western Yellow Pine in California, Oregon, Washington and Idaho. The mountain pine *Dendroctonus*† is destructive to the Mountain or Silver Pine in eastern Washington, northern Idaho, and Montana, and also infests the Sugar Pine of southern Oregon. There is also a closely allied species—the pine-destroying beetle of the Black Hills‡—which has been the cause of serious trouble in the pine forests of western South Dakota and eastern Wyoming. The Douglas spruce *Dendroctonus** is a common enemy of one of the most valuable timber trees of the Northwest. The fir tree destroyer† either kills, or causes a defective and decayed condition of the heartwood, of the California and grand fir trees from northern California to British Columbia, and westward to Montana. The Douglas spruce bark borer,‡ the western hemlock bark beetle,§ and the western hemlock bark borer‖ infest the living bark, and either kill the trees or cause gum spot defects in the wood of the Douglas Spruce and Western Hemlock in Oregon and Washington.

In addition to these examples of the enemies of the living trees and timber products, we may mention another example of the depredations on oak and hemlock tan bark by two or more species of beetles, which convert into a fine powder the "flesh" of the bark. These insects are widely distributed through the

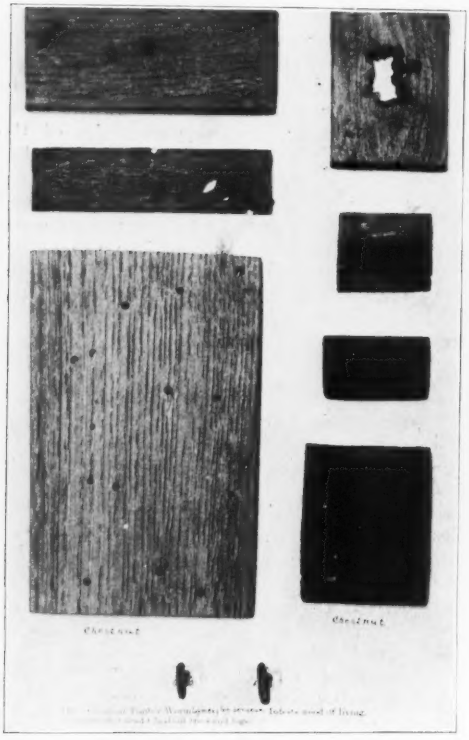
SHOWS CHARACTER OF INJURY TO PINE BARK BY THE DESTRUCTIVE PINE BARK BEETLE.

* *Dendroctonus brevicomis* Lec.
† *Dendroctonus monticola* Hopk. MS.
‡ *Dendroctonus ponderosa* Hopk. MS.

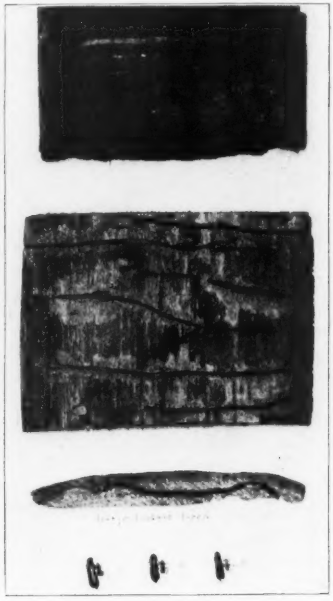
* *Dendroctonus pseudotsuga* Hopk. MS.
† *Scolytus subscaber* Lec.
‡ *Asemum nitidum* Lec.
§ *Hylesinus tsuga* Hopk. MS.
‖ *Melinophila arummondi* Kirby.

bark regions of the eastern and northeastern United States. At one tannery where the stored bark was examined by the writer some $50,000 worth of hemlock bark was infested. In one stack of over 2,000 cords the inner part of the bark was largely converted into powder.

Many other examples of the destructive ravages of insect enemies of forests and forest products could be mentioned, which



WORK OF CHESTNUT TIMBER WORM. INFESTS WOOD OF LIVING, INJURED, AND DEAD TREES AND LOGS.



WOOD BORER. LARVÆ BORE THROUGH THE OUTER SAP-WOOD JUST BENEATH SURFACE AND DIRECTLY ACROSS GRAIN, HASTENS DEATH OF TREE AND DECAY OF WOOD.

have been observed and studied by the writer, but these should be sufficient to indicate the magnitude of this feature of the forest problem.

As examples of some of the simple methods of preventing losses, suggested by a knowledge of the habits of the insects, the peculiar character of their work, and the conditions favorable and unfavorable for their depredations, we may mention the following: investigations of the tan bark insects revealed the fact that they do not attack the bark until it is two or three years old. Thus if tanners and dealers see to it that no bark is allowed to remain in the stacks or stored in sheds for more than three years from the time it is taken from the trees, all trouble from this source would be prevented.

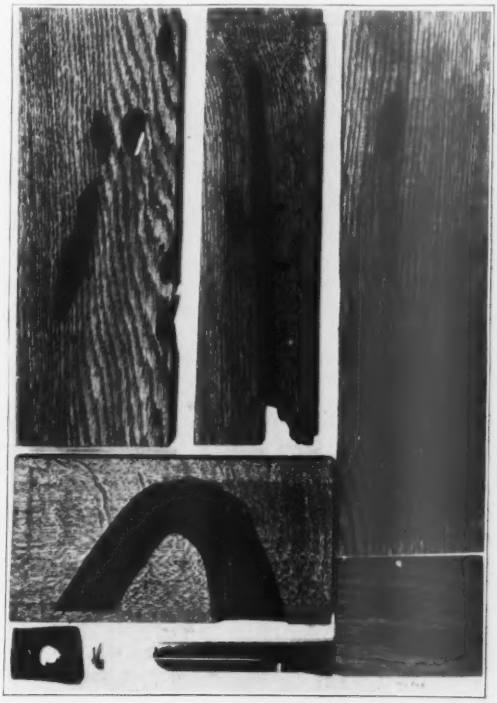
The facts determined from an investi-

gation of the spruce-destroying beetle of the northeast demonstrated the fact that this great destroyer of the spruce attacks only the larger and matured trees over 12 inches in diameter, thus suggesting the importance of harvesting the matured timber and leaving the younger growth for future supply. It was also found that the insect is single-brooded in the Maine woods, and that it can be attracted to hack-girdled trap trees. Thus if a large number of trees are girdled in an area marked for cutting the following winter, and they are near an area of matured timber that it is desired to protect for subsequent cutting, the trap trees may be cut during the ordinary logging operations. In this way the trees with their cargoes of insects may be removed during the spring log drives, before the broods emerge and thus lessening danger to the other timber. Therefore, with no additional expense beyond that of girdling, vast numbers of the insects will be effectually destroyed and the remaining timber over considerable areas protected from their ravages.

There are many other results obtained in recent investigations, which suggest methods of preventing losses from the depredations of insects on forest trees and forest products. These, even under American conditions, are capable of practical application, in some cases involving simply an inexpensive change in time of cutting and methods of handling the product.

Other methods suggested from these studies require, for their successful application, the adoption of scientific forest management. In the case of the chestnut timber worm this would require the harvesting of all matured timber, the destruction by fire of all defective trees, and the prevention of wounds on the young and thrifty timber.

In the accumulation of data relating to the kinds of insects to blame for the commoner injuries, and in that relating to some important features in their habits, life history, and distribution, considerable progress has been made within recent years. This technical knowledge of the insects, of their habits, and the character of their work will be of prime importance in subsequent investigations to determine practical methods of preventing losses. However, it will require a considerably greater expenditure of time and money than has yet been available, to demonstrate the practical value suggested by the knowledge already obtained.



CHARACTER OF INJURIES TO OAK BY THE OAK CARPENTER WORM.

Experiments in girdling and cutting timber at different times in the year, to determine the relations of time of cutting to exemption from attack by insects, and

the durability of the timber, is one of those lines of experiments which we have determined, by preliminary investigations, will yield most valuable results. But it is a line of work which, to carry to completion, involves the unlimited control or ownership of sections in various kinds of forests; also the work of several assistants, and more expense than can be allowed from the funds at present available for such work.

With the adoption of scientific forestry it is possible, through proper coöperation, to demonstrate the practical value of recommendations for preventing losses from insect depredations on forests and forest products; or to conduct new experiments for the determination of new facts. Therefore, it is hoped that in this era of liberal appropriations for scientific research, and increased interest in its value to public interests, the subject of coöperation and better facilities will receive its share of attention.

THE OPEN RANGE AND THE IRRIGATION FARMER.

By Professor R. H. Forbes,

Director Arizona Agricultural Experiment Station.

Part II.

IN this connection, moreover, comes up the problem of water storage. Those who are so earnestly advocating the storage of water in great and costly reservoirs in these regions, have here a very serious problem to contend with. I am not aware that a method has yet been devised which will keep a great reservoir clear when filled from supplies of this character.

The problem of range administration, therefore, is seen to be vitally connected with that of water storage; for if this problem remains unsolved, of what utility is it that we construct reservoirs costing millions of dollars, and create extensive farming communities beneath them, if within a limited period the reservoir is to be filled and the investment of time and labor of hundreds of farmers is thereby to be destroyed?

Yet again, the destructive force of these floods is a very serious matter throughout the southwest. When the range is bared, the water, especially on the steeper watersheds, gathers into the lower levels with great rapidity, giving rise to dangerous and destructive floods. I have observed as low as twelve and fifteen hundredths of an inch of rain to cause running water on the surface of a tramped-out range. The effects of a sudden fall of a half or three-quarters of an inch of water on such a range can be imagined.

During this present summer season, the rains having been unusually severe, numerous instances of the destructive force of these sudden floods are at hand. On the San Pedro River, one man is reported to have lost a hundred acres of fertile land in a few hours through the erosive action of the stream. At Fairbank, Ariz., in the Babacomari wash, a flood fifty feet deep collected in as many minutes, pouring fifteen feet deep over a rock-ballasted railroad which was supposed to be secure. In the Santa Cruz valley, the floods have carried everything before them, washing out bridges and deepening and extending the eroded channel of the river. These, indeed, are instances of destruction of property analogous in nature and in cause to those great floods in central Texas which, originating in devastated ranges, have accumulated as they have neared the sea, and whose disastrous results are too well known to need comment.

This briefly, is a bird's-eye view of the

situation, and having stated the case, I am morally responsible for suggestion as to a remedy. Positive answers at this time are few, for the science of "rangery," if I may be allowed to coin a word, is yet in its infancy. During the two years, however, that the Arizona station has been making its first advances in the study of southwestern conditions, the problems have begun to take shape, systematic work is under way, and results are beginning to appear.

The objects of range study are, in the first place, to demonstrate economic methods for the improvement and reclamation of the great areas of devastated, worn-out grazing lands of the semi-arid regions, and, finally, to suggest such administration of the country thus reclaimed, or the yearly decreasing areas of yet unruined ranges, that the interests of all concerned—the stockman, the irrigation farmer, and the possible investor in the storage propositions of the future—may be brought into harmony with each other, as well as be individually bettered.

In the study of ways and means whereby reclamation of worn-out ranges may be effected, the first expedient which suggests itself is the withdrawal of cattle and sheep from them.

The Arizona station, aided by the Department of the Interior, and with the coöperation of the Division of Agrostology of the Department of Agriculture, located and fenced a typical tract of some 350 acres of worn-out country near Tucson about one year ago. Even in this short period of time, the difference between the vegetation within and without our fences is very apparent, and we are most confident of results capable of economic application through the agency of rest alone. This, indeed, is an expedient whose effectiveness is well known to the stockmen of this country, and in certain districts where it has been possible in some degree to coöperate to this end, stockmen have by mutual consent refrained from putting excessive numbers of cattle upon their ranges. The uncertainties attending such efforts, however, in a country which is not owned or legally controlled by those operating in it, are too great to make applicable knowledge of the beneficial effects upon the ranges. This knowledge must be coupled with legal ingenuity in order to be effective—but more of this a little later.

Another branch of study applicable to the problem of range reservation is that of the introduction of new species of arid region vegetation capable of taking hold and furnishing additional forage in this country. When we reflect that perhaps half of the areas inhabited by civilized nations are semi-arid in character, including those regions in which formerly flourished the most ancient peoples, the possibilities for discovering drouth-resisting fruits and forage of value are certainly very attractive. Certain of our native species, also, in skillful hands, should be found capable of great improvement. The *cacti*, for instance—most changeable in the hands of the plant breeder—are full of possibilities as forage in this country. In the old world, indeed, under the stress of severer conditions—especially in Sicily—the cactus has been developed into a most remunerative forage.

Still another department of range-improvement work consists in the study of the methods and effects of water restraint and storage in the open face of the range. The current ideas of water storage are for the most part formed on colossal lines. "Save the forests and store the floods," is the prevailing cry, and in the popular mind storage means a dam, scores and perhaps hundreds of feet in altitude, and a reservoir of many square miles in extent, impounding the waters of a great river and costing many millions of dollars. The magnitude of these plans is characteristic of the age in which we live; but I desire at this time to state a principle of water storage of which we hear but little, but which has been found by other peoples and in other ages to be adequate for the maintenance of countries even more arid than this, in condition to support large populations. I refer to the construction of numerous small, cheap reservoirs and embankments across the smaller water courses and the broad, gen-

tle depressions so characteristic of our southwestern plains country. By throwing low and easily constructed embankments across the washes, one below the other at suitable intervals, great amounts of flood waters could be restrained and made to sink into the ground, where they would in large part remain available for plants.

Precisely this plan was pursued two thousand years ago in North Africa in the Roman possessions. Mr. Swingle, the agricultural explorer, who was recently there, tells me that he once visited in North Africa the remains of a great and almost unknown city which must have had a population of a hundred thousand people; the ruined columns, the great desolate market places, the proud inscriptions carved on temple fronts, all spoke of a once great and opulent commonwealth in the midst of present desolation.

The foundation of this prosperity was only to be found in the surrounding hills and plains whose slopes and swales were crossed from top to bottom with the traces of small and cheaply-constructed restraining dams and embankments. In this way this ancient people were able to support themselves on the fruits of a rainfall probably not greater than that of Arizona.

There are abundant traces, also, of prehistoric embankments in Arizona, which seem to have been intended for a similar purpose. Although archæologists may not consent to my interpretation, yet the ingenious disposition of these embankments in the broad washes leaning down from the mountains, to my mind shows them to have been intended for the restraint of water for agricultural purposes by the prehistoric Indians of this region.

Taking these features as a guide, a few acres of our range reserve were, at the expense of a few hours of one man's labor with a horse and plow, crossed by seven embankments, one below the other, at a distance of a very few rods from each other, and in no case exceeding a foot and a half or two feet in height. This system of embankments has during the past rainy season been found sufficient to restrain the run-off of water from several square miles of water-shed which discharges its flow across this ground. Although the principal embankments have on several occasions been broken by the little floods from this water-shed, the next, or the next, embankment has held, and a storage of water has resulted sufficient to soak considerable areas of ground and to induce the growth of a dense mat of vegetation later on. This corner of our range reserve is conspicuously the greenest piece of desert country with which I am acquainted in the vicinity of Tucson.

One important item in connection with the construction of numerous small embankments of this nature, is their maintenance by means of drouth-resisting forms of vegetation which shall, as far as possible, prevent their destruction by washing. We have during the last year been very fortunate in the discovery of a plant which is surpassing all expectations for this purpose. I refer to *Lippia repens*, first secured from Dr. Franceschi in California. This plant has proven itself to be most hardy to extremes of heat and drouth, and barren soil, as well as considerable frost and limited submergence by flood. A few plants placed in one of the embankments on our reserve last January by Dr. Griffiths, lived and thrived throughout the dry, hot spring just past, and at the present time has spread into patches several feet in diameter.

So much then, briefly, as to the lines of work along which we are endeavoring to demonstrate the possibility of range reclamation. The matter of administration of ranges, either those which presumably will some time be successfully reclaimed or those which have as yet fortunately not been entirely destroyed, is yet and in conclusion, to be briefly considered.

At the present time it is possible only to make suggestions based upon the manner in which ruin and washing out of the grazing valleys takes place and upon the successful practice of a very few ranchmen who have wisely prevented such destruction.

After the grass has been closely grazed the gullying-out process, as a rule, begins to take place at the lower ends of the val-

leys, where the accumulated floods are greatest and most concentrated. Beginning here and taking advantage of cattle paths, and sometimes of wagon roads, which, in the former case at least, are nearly always found traversing the lowest available ground as the animals went from place to place, the water cuts its channels from lower to higher levels up the valley. It is reasonably certain that if the centers of these valleys were protected against excessive travel and the original bunch grasses were maintained, the washing process could never take place. Indeed, the success of such a method has been demonstrated by the operations of at least one large rancher of whose ranges I have had observation. This gentleman, operating in the Sulphur Spring Valley, fifty miles from the San Simon of which I have spoken, has taken great care to guard the stream course at the bottom of his valley against excessive grazing and against trampling out by cattle. The result is that the Sulphur Spring to-day, partly for this reason, is as yet not gullied in the district controlled by this man.

If, in such a valley as the San Simon, for instance, one hundred miles of fencing, costing say fifteen thousand dollars, had been so placed as to afford the necessary protection of the lowest levels and if only reasonable numbers of cattle had been allowed on these ranges, I doubt not that to-day this barren valley would be still replete with succulent and nutritious grasses, available, under restrictions, for the maintenance of herds. This one district, at least twenty-five hundred square miles in extent, would at the extremely low rate of four animals to the square mile per year yield an annual revenue of one hundred and fifty thousand dollars in a region where now it would take hard riding and a sharp eye to gather a single train load.

There is little doubt that the administration of a range, at a cost of a very small per cent. of the results, would be a most profitable transaction to stock men, besides resulting in great benefits to the irrigation farmer below, whose interests throughout coincide with those of the stockman above him.

There can be little doubt, indeed, of the wisdom of the idea of range administration considered in its various bearings; but before it will be possible to put remedial measures into practice, however desirable they may seem, it will be necessary to settle the legal complications which at present stand in the way. Various agitations for the leasing of public lands have been made from time to time in the southwest; but so far as Arizona is concerned, they have as yet met with failure. Doubtless one of the motives leading to this agitation has been an appreciation by large owners of the fact that, if they could once be assured of their rights on the public range, there would be created an incentive for the fencing, improvement, and careful administration of those ranges. Measures of this nature, however, have been uniformly opposed by the small stockmen who, in bidding for the privilege of leasing, would he brought into competition with their more powerful neighbors.

In view of the difficulties and failure which have been encountered in this direction, and in view of the successful operations of the forest reserve system, it seems to me that we can turn with some hope of success to the idea of range reservation in Arizona and New Mexico. The Government is there yet in control of great unbroken tracts of its public lands, and those territories afford a most favorable opportunity for the institution of the experiment on a large and convincing scale. The objective point of such a work, the principles of which should be analogous to those of forest administration, should be to have such control of a range district that properly qualified wardens might permit or prohibit the presence of flocks and herds in the district according to its condition, and to so maintain necessary fences as to prevent cattle and sheep from damaging the contour of the country at such times as they should be permitted to graze. The carrying out of such a plan by impartial and authoritative means, including provisions for a proper economic and scientific study of the problems involved, ought in time to vastly improve the range for the benefit of the stockman, and also to render the operations of the irrigation

farmer and of the storage reservoir promoter much more certain of returns.

In conclusion, therefore, allow me to insist:

First, that the former productiveness of vast areas of semi-arid southwestern country has been destroyed through the ruinous operation of stockmen, working without restraining provisions of any sort upon the public ranges.

Second, that, in view of the enormous values which this country is capable of producing, both in the form of live stock and as a water-shed for the benefit of irrigation interests, the study of these range water-sheds from a scientific and economic point of view is of vast importance.

Finally, that in Arizona and New Mexico at the present time exists, from a legal point of view, perhaps the best known opportunity for the institution of range reserves and the demonstration of the beneficial results which would certainly follow.

A FOREST WORKING PLAN.*

A FORCIBLE example of the advantages of conservative forest management is given in Bulletin 30, a working plan for Township 40, Hamilton county, New York, in the Adirondack Forest Preserve, recently published by the United States Bureau of Forestry. This working plan was made through the cooperation with the state of New York, which appropriated $2,000 towards the necessary field studies. As the first instance of coöperation between the Bureau of Forestry and the government of a state, the working plan for Township 40 marks a notable step in American forestry. In outlining a sound business policy, based upon an exceedingly careful and comprehensive expert examination, it is of high value as a guide towards the best management of the forest with which it deals.

In the study of this portion of the Adirondack Preserve, the intention was to devise a system whereby the forest may be utilized profitably and its maintenance and improvement assured, without sacrificing the objects for which the Preserve is held. The solution of this problem was in the hands of these men: Mr. R. S. Hosmer directed the technical forest study; Mr. Eugene S. Bruce investigated the possibilities for lumbering, from the point of view of the experienced lumberman; while Mr. Frederick H. Newell, hydrographer of the United States Geological Survey, after personal study on the ground, discussed the influence of the conservative lumbering of Township 40, upon the water supply which it controls.

The conclusions reached in the working plan may be simply summarized as follows:

First. Under the systematic and conservative system of management advised, there would be no interference whatever with the value of the forest as a conserver of the water-supply. To this end ample reservations are recommended, which would thoroughly protect the water-sheds and preserve the lake shores from damage. Particular attention would be given to the protection of the mountain summits and the natural beauties of Raquette Lake. Only the mature softwood timber would be cut, and that under close restrictions and constant supervision.

Second. Township 40 is well-timbered. It contains a sufficiently heavy stand of mature Spruce to insure profitable lumbering under economical and conservative methods. There is also mature Pine and Balsam which should be cut.

Third. The topography makes lumbering comparatively easy, since the greater part is tributary to Raquette Lake, which occupies the center of the Township. The Raquette Lake Railway is at present the

* A Forest Working Plan for Township 40, New York State Forest Preserve, issued as Bulletin No. 30, Division of Forestry, U. S. Dept. of Agriculture.

RAQUETTE LAKE, ADIRONDACKS, NEW YORK.

VIEW OF FOREST IN TOWNSHIP 40. BALSAM UNDER HEMLOCK.

only way of getting the timber from Township 40 to the market. With the improvement of the river between Raquette and Forked lakes, which is strongly advised in this working plan, a second outlet would be secured for the timber on the greater part of Township 40, and also for all the other timber tributary to Raquette Lake. The improvement of this river, so that logs might be driven from Raquette Lake, would make a material improvement in the bids submitted for the stumpage.

Fourth. Township 40 is covered by virgin forest. In a forest of this character the annual decay of the overmature trees offsets the annual growth. Each year many large trees die or are blown down and decay. These mature trees, if harvested, would yield a considerable revenue, and at the same time, the producing power of the forest being unimpaired, the conditions of growth would be improved. Under conservative lumbering successive crops may be cut from this forest at recurring intervals for an indefinite period.

Fifth. Under practical forestry this tract would yield a sustained revenue. By the adoption of a conservative and carefully devised system of lumbering, such as that advised in the working plan for Township 40, the State would receive a sustained and increasing income from the forest preserve. This would bring about the right use of the forest resources of the State lands without in any way interfering with the objects for which the forest preserve was created, and without injury to its natural beauties.

From this statement it will be seen that the lumbering of the softwood timber under forest management is safe, practicable, and can readily be made profitable financially; that lumbering under the rules incorporated in the present working plan would tend to improve the condition of the forest, and increase its productive capacity; that such lumbering would remove overmature trees which by deterioration and decay offset the production of the forest in sound timber, and that all this may be accomplished wholly, without interference with the water supply or with any of the other objects of the Preserve.

The Bureau of Forestry therefore recommends that the necessary steps be taken to secure the lumbering of Township 40 by conservative methods.

Thorough supervision of the lumbering advised in this working plan for Township 40 by trained men is essential to the improvement of the forest, to a sustained supply of timber, and to the preservation of the water-supply. Upon the efficiency of the supervision will depend the results obtained by adopting this working plan.

THE BILTMORE FOREST SCHOOL.

THE Biltmore Forest School, under the direction of C. A. Schenck, Ph.D., provides not so much for the scientific as for the practical forester. The Biltmore estate, situated in western North Carolina at the gates of Asheville, comprising 110,000 acres of woodland owned by George W. Vanderbilt, forms its field of operations. Here, forestal work, consisting of lumbering, reforestation of abandoned land, peeling tanbark, protection from fire, in addition to the development of the agricultural, pastural, and mineral resources of the mountainous tracts, has been going on since 1890.

The task placed before the forest administration of the Biltmore estate, and continuously impressed upon the minds of the pupils at the Biltmore School, is that of converting virgin forest into a permanently paying investment.

Dr. C. A. Schenck, in daily lectures delivered at his headquarters at Biltmore, or during the summer in the mountain camps, covers in the course of the year that much of theoretical forestry as seems to him applicable to American conditions. Forestry heretofore has been a German science, no more directly applicable to America than the German code of laws.

PARTY OF STUDENTS FROM BILTMORE FOREST SCHOOL ON THEIR EUROPEAN TOUR.

A GLIMPSE INTO THE MOUNTAIN FORESTS AT BILTMORE, AFTER LUMBERING.

Hence the Biltmore School endeavors to establish the principles of American forestry.

The students living in boarding houses, on or near the Biltmore estate, meet Dr. Schenck or his assistant, Mr. F. W. Reed, or any of the twelve forest rangers, every afternoon at such places where forestal operations are at the time going on. In addition, the student at Biltmore enjoys an unrivalled chance, at Dr. Schenck's office, to get fully acquainted with the routine work of a large forest administration.

The student is required to keep a horse so as to be able to constantly watch the various phases of forestal work carried on by the administration.

In addition, a winter course is offered, ending March 15, 1902. There is scheduled to begin on April 1, 1902, a three months' tour through the European forests, on which Dr. Schenck intends to demonstrate how much or how little of European forestry is applicable to American conditions.

A CUTTING ON THE BILTMORE ESTATE.

RECENT PUBLICATIONS.

The Outcasts. By W. A. FRASER. Charles Scribner's Sons, New York. Illustrated. Pp. 137. $1.25 net.

Mr. Fraser has written a number of tales of the Great Northwestern country but none better than "The Outcasts." The narrative deals with the adventures of an old buffalo and a half-breed wolf, and in tracing their vicissitudes the author shows a keen insight into animal nature, while the whole book breathes the spirit of the great open country.

"The Outcasts" is a story of the west forty years ago, the author's descriptions of life on the plains being unusually graphic. Perhaps the best thing in the book is the description of a buffalo "run," and the sad history of that animal is finely told in these pages. Mr. Fraser has been a keen student of nature; further he has caught and portrayed the spirit of the west. It is an unusually well written book, and will delight all lovers of outdoor life. The volume is splendidly illustrated by Arthur Heming and J. S. Gordon.

Practical Text-book of Plant Physiology. By DANIEL TREMBLY MACDOUGAL, Ph.D. Longmans, Green & Co., New York. Illustrations 159. Pp. 352.

Dr. Macdougal's book combines a discussion of the principles of the subject of plant physiology with directions for practical demonstrations. This book should prove a valuable text to all students interested in plant life. The illustrations are many and appropriate and the book is a valuable addition to literature relating to plant life. Dr. Macdougal, the author, is well known as the director of the laboratories of the New York Botanical Garden.

Yearbook of the United States Department of Agriculture for 1900. Pp. 888. Plates LXXXVII., Figs. 87.

The Yearbook of the Department of Agriculture, always interesting and full of valuable information, is unusually so this time. The steady improvement so noticeable throughout the Department of Agriculture, since it passed under the direction of Secretary Wilson, is emphasized by the contents and appearance of the present volume of the Yearbook. In size it is about the same as in previous years, but more profusely illustrated. In addition to the Report of the Secretary and the Appendix this volume contains thirty-one contributed articles.

There are three contributed articles on forestry: "Practical Forestry in the Southern Appalachians," by Overton W. Price, chief of the Division of Forest Management in the Bureau of Forestry. "Forest Extension in the Middle West," by William L. Hall; and "Fungous Diseases of Forest Trees," by Herman von Schrenk. The Appendix contains a list of states having officers for forest work, a list of forest associations, schools of forestry, institutions offering instruction in forestry, and progress in forestry in 1900.

Missouri Botanical Gardens, Twelfth Annual Report. Pp. 165. Plates 47.

This report contains, in addition to the report of the Director and of the officers of the Board of Trustees, a series of most interesting scientific papers by William Trelease, Hermann von Schrenk, A. M. Ferguson, J. W. Toumey and H. C. Irish. The report is handsomely illustrated and printed, and in every way reflects great credit on the Director Mr. William Trelease.

Spanish Public Land Laws in the Philippine Islands. Published by Division of Insular Affairs, U. S. War Department. Pp. 61.

This little volume contains an English translation of the public land laws instituted in the Philippines by the Spanish government. It was compiled under the direction of Capt. Geo. P. Ahern, at the Forestry Bureau in Manila, assisted by Gregorio Basa. The book can be secured by writing to the Division of Insular Affairs U. S. War Department, Washington, D. C.

The Forest and Stream Publishing Company, New York, announce for immediate publication "My Angling Friends," by Fred. Mather; "Pictures from *Forest and Stream*"; "Manual of Taxidermy," by C. J. Maynard, and "Training the Hunting Dog for the Field and Field Trials," by B. Waters.

PUBLICATIONS RECEIVED.

Report of the Second Annual Meeting of the Canadian Forestry Association. Government Printing Bureau, Ottawa. Illustrated. Pp. 64.

Annual Report of the Nebraska State Horticultural Society for the Year 1900. Pp. 300. Plates II., Figs. 71.

Annual Report of the State Geologist of New Jersey for the Year 1900. Pp. 231. Plates III., Figs. 33.

Tenth Annual Report of Agricultural Experiment Station of the Oklahoma Agricultural and Mechanical College 1900–1901. Illustrated. Pp. 159.

Digest of Game Laws for 1901. By T. S. PALMER and H. W. OLDS. Bulletin No. 16 of Division of Biological Survey, U. S. Dept. of Agriculture. Pp. 152. VIII. Maps.

North American Fauna No. 20. By ARTHUR N. HOWELL, Division of Biological Survey, U. S. Dept. of Agriculture. Pp. 48. Plates VIII.

Rates of Charge for Transporting Garden Truck. By EDWARD G. WARD, JR., and EDWIN S. HOLMES, JR.; Bulletin No. 21, Division of Statistics, U. S. Dept. of Agriculture. Pp. 86.

Wages of Farm Labor in the United States. Bulletin No. 22; Division of Statistics, U. S. Dept. of Agriculture. Pp. 47.

The Origin and Distribution of the Cocoa Palm. By O. F. COOK, Division of Botany, U. S. Dept. of Agriculture; being No. 2 of Vol. VII. of Contributions from the U. S. National Herbarium. Pp. 257–293.

State University of Iowa. Bulletin No. 2, Vol. V. from the Laboratories of Natural History. Pp. 87–216. Plates IV., Figs. 5.

(*To be reviewed later.*)

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